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Introduction

Municipal wastewater treatment processes used in the United States were designed to receive raw municipal wastewaters from both domestic and industrial sources and produce a liquid effluent of suitable quality that can be returned to natural surface waters with a minimal impact to the environment or to public health. A byproduct of this process, called sludge or sewage sludge, contains the solid fraction from the raw wastewater and the solids produced during the wastewater treatment processes. Both the effluent and sludge are treated to quality levels suitable for disposal or recycling purposes. As described in Chapter 3, secondary treat-ment is the national standard for discharge to surface waters (although local conditions can dictate either higher or lower treatment depending on the assimilative capacity of receiving waters). When treated to acceptable levels or by appropriate processes to meet state water reuse requirements, the effluent is generally referred to as "reclaimed water." In an effort to dis-tinguish sewage sludge that is treated and managed for beneficial purposes, the wastewater treatment industry now refers to sewage sludge as "biosolids." However, for the purposes of this report, it is called "sewage sludge," or simply "sludge." The rising volume of municipal wastewater, propelled by growing population and urbanization (see Figure 1.1), has inevitably increased the volume of treated effluent and treated sludge. During the past decades, some disposal practices have been restricted. Landfill space is scarce, sitings of incineration facilities are difficult, and certain types of surface waters are adversely impacted by excess nutrient load and contaminants from treated effluents. Because of the wide range of environmental and societal problems associated with municipal wastewater and sludge disposal, municipalities have a need to find new ways to dispose of—or better, make use of—these materials. For coastal cities in particular, regulations requiring elimination of ocean disposal of sludge have pre-cipitated the need for other management alternatives.

Fortunately, these materials have the potential for use in agriculture. The simultaneous increase in the demand for water, coupled with tighter regulation over the safety of sludge, widens an opportunity to use treated effluent for irrigation, and to use treated sludge as a supplemental source of fertilizer and soil conditioner. The similarities of effluent to irrigation water and of sludge to fertilizer are further described in Chapter 2 (see Tables 2.1 and 2.2). Capturing and reusing the water and nutrient value of these materials help to conserve resources.

However, a pressing question is whether the use of these materials in an agricultural set-

FIGURE 1.1 Increasing proportion of the U.S. population served by publicly owned treatment works (POTWs). SOURCE: EPA, 1995.

ting is safe and practical. Further, is it safe in all climates, on all soils, and is it sustainable over the long term? Because human health is inevitably the leading criterion for safety, the severest test is whether treated effluents and treated sludge can be safely applied to crops that people eat.

The answer to whether wastewater and sludge can be safely applied to crops that people eat depends on several factors. These include the nature and amounts of potentially toxic or pathogenic constituents in treated effluents and sludges, the fate of these constituents once the materials are applied to an agricultural site, the potential of harmful constituents to migrate into plant tissue, the potential for other environmental impacts on water resources from runoff or infiltration, and whether long-term effects on the environment or future crop production are likely. An important safety consideration is the capability of facilities to produce treated effluent and treated sludge of consistent and reliable quality.

After safety, feasibility will govern the use of these materials in crop production. The distance of agricultural fields from the treatment plants and competition with other effluent and sludge uses or disposal practices may affect the practicality of agricultural use. A critical consideration is whether the recipients of and those affected by recycled effluents and sludge—farmers and their neighbors, the food processing industry, and consumers—will give more weight to the benefits or to the risks of applying these materials to agricultural land.

Irrigation of citrus trees with reclaimed water at the Water Conserv II reclamation project serving the City of Orlando and Orange County, Florida (courtesy of Tom Lothrop, City of Orlando Environmental Services Department).

REFERENCE

EPA. 1995. Impacts of Municipal Wastewater Treatment: A retrospective analysis. Washington, D.C.: U.S. Environmental Protection Agency, Office of Water.